AWARD WINNING ORIGINAL ARTICLE

Perceptions and attitudes of University of Johannesburg chiropractic students toward a blended learning approach and a shift to an e-learning approach necessitated by the COVID-19 pandemic

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ABSTRACT

Objective: This study aimed to explore and compare the perceptions and attitudes of chiropractic students on a blended learning offering in 2019 and a subsequent shift to an e-learning approach in 2020 owing to the COVID-19 pandemic.

Methods: This was an exploratory descriptive study of 4th-year BHSc chiropractic students enrolled in the Clinical and Applied Biomechanics IV module in 2019 ($n = 31$) and 2020 ($n = 33$). The survey used close-ended Likert scale questions collected from 29 July to 14 August 2020. Data were analyzed using frequencies and descriptions, exploratory factor analysis, and reliability. Trends and interrelationships of and between student attitude, satisfaction, social influences, ease of use, accessibility, and effectivity were investigated for each year and compared between successive years' cohorts.

Results: Students were mostly female (76.6%), aged 20 to 24 years (84.4%). Although both cohorts showed similar positive attitudes, accessibility, and satisfaction levels, the e-learning group showed increased effectivity ($p = .016$) and ease of use ($p = .038$) compared with the blended learning cohort. Face-to-face time with the lecturer was shown to be more important to the blended learning cohort ($p = .006$). Strong correlations were demonstrated in both cohorts between accessibility and satisfaction with attitude, effectivity, and ease of use.

Conclusion: Findings suggest that students were more receptive to an e-learning approach than they may have been in the past. This may be as a direct consequence of the response to COVID-19, and the adapted offerings of the curriculum.

Key Indexing Terms: Chiropractic; Education; South Africa; Online learning; COVID-19

INTRODUCTION

The 4th industrial revolution is currently underway with the potential to change everyday life in many ways, for example, connecting the Internet to objects. Technology is continually developing and is incorporated in many aspects of our home and work lives.[1] Higher education has not been excluded from the pressures of technological advancements[2] and has had to adapt to meet demands of globalization,[3] administrative requirements,[4,5] knowledge commodification, and developments in information accessibility and technology.[6] University stakeholders understand that the incorporation of nontraditional technological methods of learning are key to their subsistence[7] in a transforming educational environment.

This technological undercurrent motivated the Department of Chiropractic at the University of Johannesburg to pilot the Clinical Biomechanics and Kinesiology IV (CBK-IV) module for 4th-year chiropractic students as a blended learning format in 2019. This was different from the traditional face-to-face presentation previously. This chiropractic course underwent a curriculum development process in 2020, and the involved module received a name change to

Clinical and Applied Biomechanics IV (CAB-IV), while content remained unchanged. Blended learning, also known as hybrid learning,[8] was the selected approach owing to its perceived effectiveness[8–10] resulting from the complementary combination of traditional face-to-face contact sessions with online or e-learning components.[9,11–13] This dual structure allowed students to use technology without sacrificing social interaction with peers and lecturers,[9,14] minimizing the effects of psychological distance.[14,15] The incorporation of blended learning into a course presented its own set of obstacles ranging from access to reliable equipment and the Internet[11] to uneasiness with students' understanding the need for self-regulation and technological competence.[8] Lecturers are the main influence on course satisfaction[11] and need to be educated not only in their field of expertise, but in the technological components of blended learning, to provide the most efficient methods of education for their modules.[8]

A learner management system is designed as a support system for educational purposes to enrich the educational process[16] and provide a platform for different teaching methods.[17] Learner management systems are incorporated in blended learning because they can be used independently by students, are instructor led, are more focused on academics rather than the social component of education, and allow for self-evaluation and assessment.[18] Learner management systems are used for multiple purposes including, but not limited to, content sharing, scheduling, discussion forums, course management, and student tracking (such as attendance, online grading, assessments, and questionnaires).[16,17,19] Blackboard (Blackboard Inc, Providence Equity Partners, Washington, DC, USA), an online closed-source learner management system,[16] is the platform used by the University of Johannesburg. The Blackboard learner management system allows instruction, assessment, and communication between student and lecturer in a controlled and convenient environment with content that is controlled by the lecturer or instructor.[20]

The novel coronavirus 2019 (COVID-19), an infectious respiratory disease caused by SARS-Cov2, was declared a pandemic by the World Health Organization on 11 March 2020.[21] South Africa reported its first case of COVID-19 on 5 March 2020. The South African president declared a national state of disaster on 15 March 2020 followed by a national lockdown 8 days later, which was further extended by another 5 weeks. This lockdown imposed a complete shutdown of the economy with the exception of essential services.[22] Universities were not spared and were no longer able to continue on-site or face-to-face operations. The 2019 CBK-IV blended learning module saw an abrupt necessitated shift to a complete e-learning format as a direct result of the COVID-19 response.

The transformation of the CBK-IV module from a traditional face-to-face format to blended learning and then finally to an e-learning module highlighted the need for evaluation of its implementation and effectiveness to determine its overall success, with consideration to the impact of the COVID-19 pandemic on the module. Therefore, the purpose of this study was to evaluate and determine in the form of quantitative feedback from students, their perceptions and attitudes toward the module. This input is crucial in order to make improvements and enhance student satisfaction,[23] as well as to provide further insights on how to navigate higher education in the "new normal" defined globally by the COVID-19 pandemic.

METHODS

Approval for this study was received by the University of Johannesburg Faculty of Health Sciences Higher Degrees Committee, Research Ethics Committee (REC-01-04-2019), and the head of the Chiropractic Department. The study was done at the University of Johannesburg in the Department of Chiropractic situated on the Doornfontein campus in Johannesburg, South Africa. This explorative, quantitative, and descriptive study was based on a non-probability, voluntary response sampling strategy.[24]

The sample for this study was specific to the 4th-year (BHSc) and 5th-year (MHSc) chiropractic students that were enrolled for the module Clinical Biomechanics and Kinesiology IV in 2019 and Clinical and Applied Biomechanics IV in 2020, respectively. The classes of 2019 and 2020 were selected to pilot a blended learning version of the module. Both the 2019 and 2020 students in this module had to be included because of the small number of students per year. However, there was a necessitated shift from this blended learning module to an e-learning offering as a direct result of the COVID-19 pandemic in 2020. Therefore, this study was only applicable to the students that completed this module in 2019 and 2020 to determine their perceptions and attitude to both the blended and e-learning approaches. There were 64 students enrolled in these modules: 31 students from the 2019 cohort and 33, from the 2020 cohort.

The questionnaire used was adapted by the researchers based on 3 other studies.[11,23,25] The questionnaire consisted of 2 sections: section A on demographic data (age, gender, year of completion, and economic status) and section B on blended and e-learning content arranged on a close-ended Likert scale ranging from "1, strongly disagree" to "5, strongly agree." It took from 15 to 20 minutes to complete. Section B was divided into 6 subscales: attitude, social influences, effectivity, accessibility, ease of use, and satisfaction. The questionnaire is included in Appendix A.

The "attitude" subscale explored the attitudes of students toward the blended and e-learning approach, including if the approach was well perceived and time efficient. Social influences focused on the importance of face-to-face classes, peer interactions, motivation to complete online content, and work–school–family balance. The focus in the "effectivity" subscale was largely on preference for online learning and blended learning over traditional learning. Online learning can have many technical challenges, and the assistance to those challenges directly affects the effectivity of blended or e-learning modules. Accessibility referred to the access to the Internet, content, and clarifying whether there were any

technical issues regarding blended and e-learning. The "ease of use" subscale involved the learner management system Blackboard and general technological skills. Because student satisfaction is an important component to the success of any module, the "satisfaction" subscale was fundamental in this research study and explored the willingness of students to make use of blended and e-learning modes. A pilot study was performed with the 2020 MHSc chiropractic students to determine if the questionnaire was easily understandable.

Relevant lecturers were contacted to obtain permission to distribute the questionnaires at the end of scheduled lecture times for the selected sample students. The researcher approached each class, explained the process of the study, and highlighted the anonymity of the study. The researcher explained that the study was completely voluntary and answered any questions that the participants may have had. Two boxes, one marked "questionnaire" and the other marked "consent" were placed in the lecture room. Each box was color coordinated with the relevant set of pages. The researcher then left the lecturing venue to allow the students to read and complete the information letter, consent form, and questionnaire. Students were asked to place the forms in the relevant boxes upon completion. Students were advised to place unfilled forms into the boxes if they chose not to participate. Collection took place from 29 July to 14 August 2020. Students completed the questionnaire upon returning to the university once the lockdown was lifted and the module was completed in full.

Descriptive statistics were analyzed for each question, including means, standard deviations, medians, modes, minimums, and maximums. Factor analysis was performed, and reliability was determined on the Likert-scale–based items. Descriptive statistics were calculated on the identified and finalized scales and factors. Tests for normality were performed using the Shapiro-Wilk test because the final sample size included more than 50 participants. A comparison was then conducted between the 2019 and 2020 cohorts using the Mann-Whitney U test because the data were not normally distributed. The SPSS version 26.0 software program (Statistical Product and Service Solutions, IBM, Armonk, NY, USA) was used for data analysis.

RESULTS

Demographic Data

The collected data indicated that 84.4% ($n = 54$) of the sample students were between the ages of 20 and 24 years. The balance of the sample consisted of 12.5% ($n = 8$) students aged 25–29 years and 3.1% ($n = 2$) students aged 30–34 years. Female students were the majority at 76.6% ($n = 49$). The 2019 cohort consisted of 48.4% ($n = 31$) of the total sample, while 51.6% ($n = 33$) of the sample completed the module in 2020. In terms of economic status, 4.7% ($n = 3$) of the sample identified themselves as below average, 75% ($n = 48$) as middle class, and 20.3% ($n = 13$) as above average.

Internal Consistency

Due to the use of an adapted questionnaire, each subscale was assessed for internal consistency. A subscale is deemed reliable or internally consistent if the Cronbach's alpha is a score of 0.700 or higher.[26,27] The following subscales showed satisfactory reliability with Cronbach's alpha values: attitude with 5 items (0.852), effectivity with 5 items (0.800), accessibility with 5 items (0.885), ease of use with 3 items (0.740), and satisfaction with 5 items (0.867). The subscale "social influences", with 3 items, proved to be unreliable as a standalone subscale, with a Cronbach's alpha value of −0.121. The items listed under the subscale "social influences" were still included; however, they were discussed separately to identify any possible trends and comprised "blended learning improved interaction with my classmates," "face-to-face time with my lecturer is important," and "blended learning allows a better work–school–family balance."

Subscales

Six subscales were investigated: attitude, social influences, effectivity, accessibility, ease of use, and satisfaction. Table 1 represents the number and percentage distribution of responses, ranging from "strongly disagree" to "strongly agree," in the total sample for each subscale. Table 2 presents the mean, median, and standard deviation for each subscale in the 2019 blended and 2020 e-learning cohorts.

Due to the small sample size, the abnormal distribution of the data, and the outliers, comparisons could not be performed on age, gender, and economic status.

Statistically significant differences were noted between the 2019 blended and 2020 e-learning student cohorts for the following subscales: effectivity ($p = .016$), ease of use ($p = .038$), and "face-to-face time with my lecturer is important" ($p = .006$) from the "social influences" subscale. Attitude ($p = .184$), accessibility ($p = .134$), satisfaction ($p = .064$), "blended learning improved interaction with my classmates" ($p = .124$), and "blended learning allows a better work–school–family balance" ($p = .149$) from the "social influences" subscale all lacked any statistically significant differences between the 2 cohorts.

Correlation Analysis

Due to the small sample size, Spearman rank correlation test was performed to determine if there was any correlation between the different subscales. This analysis was conducted separately for the 2019 blended cohort and the 2020 e-learning cohort.

2019 Blended Learning Cohort

There was a strong positive monotonic correlation between the subscale "accessibility" and the following: attitude ($r_s = 0.623$, $n = 31$, $p = .000$); "blended learning allows for a better work–school–family balance" ($r_s = 0.575$, $n = 31$, $p = .001$); effectivity ($r_s = 0.765$, $n = 31$, $p = .000$); ease of use ($r_s = 0.550$, $n = 31$, $p = .001$); and satisfaction ($r_s = 0.637$, $n = 31$, $p = .000$).

The subscale "satisfaction" also showed a strong positive monotonic correlation with the following: attitude

Table 1 - Responses per Subscale for the Total Sample

Subscale and Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Attitude						
I am in favor of incorporating blended learning to my course.	1 (1.6)	1 (1.6)	6 (9.4)	21 (32.8)	35 (54.7)	64 (100)
Blended learning has deepened my interest in the subject.	1 (1.6)	3 (4.7)	17 (26.6)	27 (42.2)	16 (25)	64 (100)
Blended learning made the subject enjoyable.	1 (1.6)	2 (3.1)	9 (14.1)	32 (50)	20 (31.3)	64 (100)
I had enough motivation to complete the online content in an appropriate amount of time.	4 (6.3)	9 (14.1)	14 (21.9)	20 (31.3)	17 (26.6)	64 (100)
I prefer using technology to help me study.	1 (1.6)	2 (3.1)	15 (23.4)	23 (35.9)	23 (35.9)	64 (100)
Social influences						
Blended learning improved interaction with my classmates.	9 (14.1)	19 (29.7)	21 (32.8)	10 (15.6)	5 (7.8)	64 (100)
Face-to-face time with my lecturer is important.	0 (0)	1 (1.6)	13 (20.3)	17 (26.6)	33 (51.6)	64 (100)
Blended learning allows a better work–school–family balance.	3 (4.7)	0 (0)	14 (21.9)	17 (26.6)	30 (46.9)	64 (100)
Effectivity						
Studying for tests was easier because of blended learning.	1 (1.6)	3 (4.7)	12 (18.8)	26 (40.6)	22 (34.4)	64 (100)
Blended learning made my course more time efficient.	1 (1.6)	0 (0)	4 (6.3)	23 (35.9)	36 (56.3)	64 (100)
Blended learning is more effective than traditional in-class delivery.	5 (8.2)	6 (9.8)	17 (27.9)	17 (27.9)	16 (26.2)	61 (100)
The online content was presented well.	0 (0)	0 (0)	4 (6.3)	20 (31.3)	40 (62.5)	64 (100)
The online content was easy to understand.	0 (0)	0 (0)	3 (4.7)	23 (35.9)	38 (59.4)	64 (100)
Accessibility						
I received adequate technical assistance.	1 (1.6)	4 (6.3)	16 (25.0)	24 (37.5)	19 (29.7)	64 (100)
No information was lost with the blended learning approach.	3 (4.7)	5 (7.8)	8 (12.5)	25 (31.9)	23 (35.9)	64 (100)
Internet access was NOT an issue for me.	2 (3.1)	5 (7.8)	9 (14.1)	20 (31.3)	28 (43.8)	64 (100)
I was able to access the online content without any technical problems.	1 (1.6)	5 (7.8)	8 (12.5)	21 (32.8)	29 (45.3)	64 (100)
My personal devices (cell phone, tablet, and laptop) helped me with my blended learning module.	0 (0)	1 (1.6)	4 (6.3)	17 (26.6)	42 (65.6)	64 (100)
Ease of use						
I found Blackboard easy to use.	1 (1.6)	1 (1.6)	6 (9.4)	30 (46.9)	26 (40.6)	64 (100)
Blackboard is a convenient source of information on study material.	1 (1.6)	1 (1.6)	9 (14.1)	24 (37.5)	29 (45.3)	64 (100)
I find blended learning more convenient than face-to-face learning.	3 (4.7)	12 (18.8)	13 (20.3)	19 (29.7)	17 (26.6)	64 (100)
Satisfaction						
I prefer to receive information via Blackboard.	2 (3.1)	2 (3.1)	8 (12.5)	24 (37.5)	28 (43.8)	64 (100)
My computer skills have improved because of this course.	2 (3.1)	5 (7.1)	18 (28.1)	18 (28.1)	21 (32.8)	64 (100)
I am willing to take another course using the blended learning delivery mode.	1 (1.6)	2 (3.1)	9 (14.1)	18 (28.1)	34 (53.1)	64 (100)
I am satisfied enough with this blended learning module to recommend it to others.	1 (1.6)	2 (3.1)	10 (15.6)	21 (32.8)	30 (46.9)	64 (100)
I understood the content better because of the blended learning approach.	1 (1.6)	5 (7.8)	27 (42.2)	17 (26.6)	14 (21.9)	64 (100)

Data are presented as n *(%).*

($r_s = 0.806$, $n = 31$, $p = .000$); "blended learning allows for a better work–school–family balance" ($r_s = 0.622$, $n = 31$, $p = .000$); effectivity ($r_s = 0.746$, $n = 31$, $p = .000$); accessibility ($r_s = 0.637$, $n = 31$, $p = .000$); and ease of use ($r_s = 0.741$, $n = 31$, $p = .000$).

2020 E-Learning Cohort

A strong positive monotonic correlation between the subscale "accessibility" and the following was shown: attitude ($r_s = 0.581$, $n = 33$, $p = .000$); "blended learning allows for a better work–school–family balance" ($r_s =$

Table 2 - Measures of Central Tendency for All Subscales in the 2019 Blended and 2020 E-Learning Cohorts

Subscales	Year	*N*	Mean	Median	+/− 1 SD
Attitude	2019	31	3.839	4.000	0.835
	2020	33	4.103	4.200	0.669
	Total	64	3.975	4.000	0.759
Effectivity	2019	31	4.031	4.200	0.664
	2020	33	4.418	4.600	0.551
	Total	64	4.230	4.200	0.634
Accessibility	2019	31	3.961	4.000	0.886
	2020	33	4.248	4.400	0.730
	Total	64	4.109	4.200	0.815
Ease of Use	2019	31	3.785	4.000	0.863
	2020	33	4.212	4.333	0.671
	Total	64	4.005	4.000	0.793
Satisfaction	2019	31	3.800	3.800	0.900
	2020	33	4.200	4.400	0.630
	Total	64	4.006	4.000	0.792

0.443, $n = 33$, $p = .010$); effectivity ($r_s = 0.650$, $n = 33$, $p = .000$); ease of use ($r_s = 0.580$, $n = 33$, $p = .000$); and satisfaction ($r_s = 0.482$, $n = 33$, $p = .005$).

Similar to the 2019 cohort, the subscale "satisfaction" also showed a strong positive monotonic correlation with the following subscales: attitude ($r_s = 0.791$, $n = 33$, $p = .000$); "blended learning allows for a better work-school–family balance" ($r_s = 0.464$, $n = 33$, $p = .007$); "face-to-face time with my lecturer is important" ($r_s = 0.765$, $n = 33$, $p = .002$); effectivity ($r_s = 0.521$, $n = 33$, $p = .002$); accessibility ($r_s = 0.482$, $n = 33$, $p = .005$); and ease of use ($r_s = 0.664$, $n = 33$, $p = .000$).

DISCUSSION

The 4th-year BHSc (2020) and MHSc (2019) chiropractic students at the University of Johannesburg demonstrated positive perceptions to a pilot blended learning module. Additionally, the sudden shift to an e-learning approach was also well perceived. While both approaches were well received overall, there were significant similarities and differences noted between the student cohorts that were possibly influenced by the circumstances associated with the COVID-19 pandemic. Similar inclinations were noted in the students' attitudes, as well as accessibility and satisfaction levels, while differences were apparent with increased ease of use and effectivity experienced by the e-learning cohort. The amount of face-to-face time with the lecturer, while important to both groups, was deemed more important by the blended learning cohort.

Students frequently look for shortcuts with regard to learning, which suggests that if students are provided with possibilities to facilitate their knowledge acquisition, they will have positive attitudes.[18] Students are under pressure with module workloads and high-performance expectations in their theoretical and practical modules and thus attempt to find ways to alleviate these pressures.[18] Therefore, if the student perceives a learning approach as more effective than traditional techniques, the student may form a more positive attitude toward that approach. The

success of blended learning largely relies on the student's attitude, which will go on to impact their expectations and ultimately their satisfaction.[23] By creating positive attitudes among students, educators may influence students' levels of satisfaction with the learning approach.[23] Similarly, a student's satisfaction with a learning approach will have an influence on their attitude about future opportunities for the same type of learning approach.[23]

The reliable access to technology is a strong influencing factor in student satisfaction with blended and e-learning.[11] However, access to technology is not the only factor to consider when discussing student satisfaction with regards to technology. Blended learning and e-learning use different presentation programs, learner management systems, and communication techniques. Students must be comfortable using these programs for them to excel in their studies. It is mentioned that economic, social, and cultural influences all impact the student's degree of digital literacy and that the immediate presence of technological equipment does not directly influence the degree of digital literacy.[10] Digital literacy is a necessity in modern education and can prove to be a hindrance in the effectivity of blended learning or e-learning if a student cannot operate the necessary technology. Considering the relative ages of the students in the current study, they were comfortable with technology and may experience less technological hindrances than older generations.[8]

Multiple items affect student satisfaction, including performance of the lecturer, proper feedback from the lecturer, access to technology, and student performance. Student satisfaction is a critical factor in the success of the blended learning approach[11,12,23] and directly influences a student's level of motivation. Overall satisfaction of the students is largely dependent on lecturer performance.[11] Lecturer feedback and motivation skills positively enhanced students' satisfaction. The availability of technical support may present as a disadvantage of blended learning, influencing students' satisfaction levels adversely.[11] When comparing levels of satisfaction between blended learning and traditional learning, blended learning showed increased satisfaction rates.[9,15,28] This preference

for blended learning may be due to many reasons, including learning flexibility with regards to style of learning and time flexibility, less interruptions during lectures, and less digression from the topic at hand.

There is an overwhelming preference of students toward blended learning over e-learning in the literature, mainly owing to the lack of social interaction with e-learning.[29–35] However, the students in this study did not show significant partiality to blended learning and presented results inconsistent with the vast literature supporting blended learning as the superior approach. The students in this study had similar inclinations regarding attitude, accessibility, and satisfaction in both the blended learning and e-learning approaches. The attitudes of this student sample toward e-learning may be idiosyncratic because of the influence of the COVID-19 pandemic, where students were cognizant of the need to continue with teaching and learning virtually irrespective of the mode used and their previous reservations. These findings may have been influenced by the small sample size, which was predominantly female in this study. Female students have shown statistically significant support for the e-learning portal when compared with male students.[36]

An important factor to consider for the success of blended learning and the ease of use is the learning management system used and students' familiarity thereof.[23] The students in the current study received training in their 1st year of studies on how to use Blackboard. Learner management systems serve to support, enrich, and improve the quality of education[16] and provide a convenient location for students to access relevant resources related to their studies, at any time provided there is Internet access.[11,16,17,19] Initial face-to-face interaction influences the use and engagement in learner management systems among students. Likewise, the use of a learner management system will influence subsequent face-to-face learning by functioning as an effective managerial factor.[18] A research study on students' perceptions of blended learning investigated the ease of use of the learner management system, Moodle (Moodle Pty Ltd, West Perth, WA). In this study, students indicated that they strongly agreed that their learner management system was easy to use.[23] When the convenience of blended learning was compared with that of traditional learning in a study by Ja'ashan,[25] neither blended learning nor traditional learning proved superior.[25] Most students in the current study agreed that Blackboard was easy to use and indicated that both blended learning and e-learning were indeed more convenient than traditional learning, contrary to the results shown in the study by Ja'ashan.[25]

Institutional limitations prevented any form of assessment proctoring in both the blended and e-learning cohorts in this study. One would assume that this lack of assessment monitoring may have positively impacted the students' preference to the online environment, and this would warrant further investigation in the context of this sample. However, other studies where proctoring systems were used showed that while students comprehend the importance of proctoring systems to maintain assessment integrity, they were averse to the environmental and psychological aspects related to a proctoring system.[37,38] Students in the Kharbat and Abu Daabes study[38] were not satisfied with the proctoring system and would not choose to use it if they had the opportunity.

Students in 2 other studies indicated that blended learning was as effective as traditional learning when comparing knowledge and skill acquisition and concluded that blended learning was less stressful for students.[23,25] Possible reasons why students may perceive blended and e-learning to be effective are the flexibility they offer and the accommodations for diverse student learning styles, further supporting effectivity.[14] This is supported by a study by Law and Geng[9] that states that students have more flexibility in deciding when to engage in learning activities, which could be an influencing factor in the overall effectivity of blended learning. The flexibility of blended and e-learning may contribute to the concept of "perceived effectivity," where students do not necessarily need improved learning outcomes with blended and e-learning to consider the methods effective; students merely need to feel it is more effective to influence their attitude and satisfaction toward both approaches.[8,10] Another study by Abou Naaj, Nachouki, and Ankit,[11] in contradiction, found that their students believed that blended learning was less effective than traditional learning. This outcome may be because the study was done in 2012 when technology and online teaching methods were less advanced. Effective blended and e-learning is largely dependent on the active engagement of students and lecturers with the content, implying that students and lecturers need to be actively involved and taking responsibility for their education.[14] Students must be informed of the expectations of any blended or e-learning approach. Social and cultural differences may also have an influence on students perceived effectivity.

Interaction between students and lecturers is tantamount in any learning environment[9], and face-to-face contact is one of the most influential aspects to the success of blended learning because students are reassured of their progress by such contact.[14] It was evident in this study sample that while both student cohorts valued face-to-face time with their lecturer and peers, the 2019 blended learning cohort showed an increased preference for face-to-face contact when compared with the 2020 e-learning cohort. An introductory face-to-face lecture is crucial to support students through the blended learning approach[8] but does not negatively impact learning performance.[9,18] Both the 2019 and the 2020 student cohorts received an introductory face-to-face session with their lecturer. The subscale "social influences," with 3 items, proved to be unreliable as a standalone subscale possibly because students may value different social influences, such as lecturer, peer, or family influences differently based on personal preference. The difference in preference between the 2019 and 2020 cohorts is likely owing to the restrictions of the COVID-19 pandemic, where students had no option but to continue independent of any face-to-face contact, while the 2019 students had the expectation of intermittent face-to-face contact.

The results found and conclusions made in this study are unique to the student sample and the period in which the study was done, that is, the chiropractic students during the COVID-19 pandemic in South Africa. The study showed distinct trends, but further investigation is warranted on other student samples during the COVID-19 pandemic to determine if the presence of the pandemic has an influence on students' perceptions and attitudes to blended and e-learning.

Limitations

Owing to the limited sample size, statistical analysis of gender and age comparisons were not possible. Most participants in this study were female, thus data may have lacked male influence. The long-term attitudes and perceptions of blended and e-learning were not investigated in this study. The subscale "social influences" did not show internal consistency. The module discussed in this study was theoretical in nature, and thus, a practical context was not investigated. This study only reported on subjective data concerning the blended learning and e-learning module. A correlation of the subjective data with objective data would provide further evidence about the effectiveness of blended and e-learning. It should be noted that this study compared blended learning with e-learning during the COVID-19 pandemic, producing results that may not be generalized to a comparison done under normal circumstances.

CONCLUSION

The findings of this study indicated both similarities and differences between the 2 cohorts with an overall positive perception and attitude to both the blended learning and e-learning approaches. Similarities were seen between the blended learning and the e-learning cohorts with paralleled attitudes, accessibility, and satisfaction levels in both approaches. Statistically significant differences were seen with increaesd effectivity and ease of use with the e-learning approach over the blended learning approach. It is interesting to note that while the e-learning cohort acknowledged the importance of face-to-face interaction with the lecturer and classmates, the blended learning cohort seemed more dependent on face-to-face time. Accessibility and student satisfaction were mostly influenced in a positive manner to the effectivity of the blended learning module for the 2019 cohort, while accessibility and student satisfaction were mostly influenced positively by student attitude in the 2020 cohort. These findings suggest that students are now more receptive to an e-learning approach, where they may not have been previously. This outcome may be a direct consequence of the academic responses required during the COVID-19 pandemic, and the adapted offerings of the curriculum.

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Appendix A - **Questionnaire**

Attitude
    1. I am in favor of incorporating blended learning/e-learning into my course.
    2. Blended learning/e-learning has deepened my interest in the subject.
    3. Blended learning/e-learning made the subject enjoyable.
    4. I had enough motivation to complete the online content in an appropriate amount of time.
    5. I prefer using technology to help me study.
Social influences
    6. Blended learning/e-learning improved interaction with my classmates.
    7. Face-to-face time with my lecturer is important.
    8. Blended learning/e-learning allows a better work–school–family balance.
Effectivity
    9. Studying for tests was easier because of blended learning/e-learning.
    10. Blended learning/e-learning made my course more time efficient.
    11. Blended learning/e-learning is more effective than traditional in-class delivery.
    12. The online content was presented well.
    13. The online content was easy to understand.
Accessibility
    14. I received adequate technical assistance.
    15. No information was lost with the blended learning/e-learning approach.
    16. Internet access was NOT an issue for me.
    17. I was able to access the online content without any technical problems.
    18. My personal devices (cell phone, tablet, and laptop) helped me with my blended learning/e-learning module.
Ease of use
    19. I found Blackboard easy to use.
    20. Blackboard is a convenient source of information on study material.
    21. I find blended learning/e-learning more convenient than face-to-face learning.
Satisfaction
    22. I prefer to receive information via Blackboard.
    23. My computer skills have improved because of this course.
    24. I am willing to take another course using the blended learning/e-learning delivery mode.
    25. I am satisfied enough with this blended learning/e-learning module to recommend it to others.
    26. I understood the content better because of the blended learning/e-learning approach.